

REMARKS

Please reconsider the present application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully considering the present application.

I. Disposition of Claims

Claims 1-17 are currently pending in the present application. By way of the reply, claims 1, 5, and 8 have been amended and claim 7 has been canceled without prejudice or disclaimer.

II. Claim Amendments

Claim 1 has been amended to require a semiconductor die that has an active side adapted to face and be connected to the substrate, where the active side has power connections arranged to distribute power to and from the semiconductor die, and where the semiconductor die is arranged to fit within the aperture of the unitary capacitor when the semiconductor die and the unitary capacitor are connected to the substrate. Further, the limitations added to claim 1 by way of the Response to the final Office Action of July 23, 2003 have been amended. No new matter has been added by way of these amendments as support for these amendments may be found, for example, in Figure 5 of the present application.

Claim 5 has been amended to be consistent with the language of claim 1. No new matter has been added by way of this amendment.

Claim 8 has been amended to recite that the semiconductor die has an active side

that faces a portion of a top surface of the package substrate, where power connections between the active side and the package substrate distribute power to and from the semiconductor die. No new matter has been added by way of this amendment as support for this amendment may be found, for example, in Figure 5 of the present application.

III. Rejection(s) Under 35 U.S.C § 112

Claims 1-17 of the present application were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Particularly, the subject matter added to the claims of the present application by way of the Response to the final Office Action of July 23, 2003 was held as not being described in the Specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the present application was filed, had possession of the claimed invention.

By way of this reply, the limitations added by way of the Response to the final Office Action of July 23, 2003 have been removed. Accordingly, the aforementioned § 112, first paragraph, rejection has been rendered moot, and withdrawal of the § 112, first paragraph, rejection is respectfully requested.

IV. Rejection(s) Under 35 U.S.C § 102

Claims 8 and 11 of the present application were rejected under 35 U.S.C. § 102(b) as being anticipated by United Kingdom Reference No. GB 2098001A issued to Schaper (hereinafter "Schaper"). For the reasons set forth below, this rejection is respectfully traversed.

The present invention is directed to a flip-chip assembly in which a unitary

“windowframe” capacitor having an aperture is arranged to surround a semiconductor die. A “flip-chip” assembly is one in which an active side of the semiconductor die is disposed facing the substrate. For example, as shown in the exemplary embodiment of the present invention shown in Figure 5 of the present application, power connections 14 are positioned between an active side of semiconductor die 11 (shown in Figure 5 as being the bottom surface of semiconductor die 11) and package substrate 13.

Accordingly, amended independent claim 8 of the present application requires that the semiconductor die have an active side that faces a portion of a top surface of a package substrate, where power connections between the active side and the package substrate distribute power to and from the semiconductor die.

Schaper, in contrast to the present invention, fails to disclose at least the limitations of amended independent claim 8 of the present application discussed above. As shown in Figures 1 and 2 of Schaper, conductive leads 27 connect conductive portions 40 of the capacitor 20 to the semiconductor die 14, where the conductive portions 40 serve as the terminal and plates of the capacitor 20 and as planar power and ground members for interconnecting an external power supply to the semiconductor die 14. *See* Schaper, Abstract. Thus, it is clear that in Schaper, an active side of the semiconductor die 14 faces away from the substrate 16. Accordingly, Schaper fails to disclose, or otherwise teach, a semiconductor die having an active side that faces a surface of the substrate as required by amended independent claim 8 of the present application.

In view of the above, Schaper fails to show or suggest the present invention as recited in amended independent claim 8 of the present application. Thus, amended independent claim 8 of the present application is patentable over Schaper. Dependent

claim 11 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

V. Rejection(s) Under 35 U.S.C § 103

Claims 1-3, 5, and 7

Claims 1-3, 5, and 7 of the present application were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of Applicant's Prior Art Figure 1. Initially, Applicant notes that claim 7 of the present application has been canceled by way of this reply, and thus, the § 102 rejection of claim 7 is now moot. With respect to claims 1-3 and 5 of the present application, for the reasons set forth below, this rejection is respectfully traversed.

The present invention as claimed in amended independent claim 1 of the present application requires the combination of (i) the feature of a semiconductor die having an active side facing a substrate and (ii) the feature of a unitary capacitor having an aperture arranged to surround the semiconductor die when the semiconductor die and the unitary capacitor are connected to the substrate.

In the Office Action of March 8, 2004, the Examiner states that it would have been obvious to one skilled in the art to modify the semiconductor die of Shaper to include a bottom surface that is provided with electrical connections as shown in Applicant's Prior Art Figure 1. However, Applicant notes that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must *both* be found in the prior art, *not* in Applicant's disclosure. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991) (emphasis added). Further, the mere fact that references can be combined or modified does

not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990). In other words, there must be some objective reason to combine the teachings of the reasons. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

Schaper describes in great detail an implementation of a semiconductor package assembly in which conductive leads are used to connect a capacitor to a top-facing active side of a semiconductor chip. *See* Schaper, Figures 1 – 7. If Schaper had at all contemplated providing power connections between a down-facing active side of a semiconductor chip and a substrate, the various configurations disclosed in Schaper would be unnecessary in that the elaborate power connection configurations of Schaper (*see, e.g.,* Schaper, Figures 6 and 7) could be obviated by power connections disposed between the semiconductor chip and the substrate. Thus, effectively, Schaper actually teaches away from the use of a semiconductor chip having an active side facing the substrate because all of the embodiments of Schaper are specifically directed to ways to distribute power to and from an active side of a semiconductor chip that faces away from the substrate. Additionally, Applicant respectfully notes that Schaper was filed in 1982, prior to the proliferation of flip-chip technologies. In sum, Schaper fails to provide any motivation or suggestion to modify its teachings to include a semiconductor die that has an active side that faces the substrate.

Thus, without having the present application as a guide, one skilled in the art would find no motivation or suggestion in Schaper to modify the teachings of Schaper to arrive at the limitations of the claimed invention. Accordingly, in view of the above, the combination of Schaper and Applicant's Prior Art Figure 1 is improper. Thus, amended

independent claim 1 of the present application is patentable over Schaper and Applicant's Prior Art Figure 1. Dependent claims 2, 3, and 5 are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 4

Claim 4 of the present application was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of Applicant's Prior Art Figure 1 and U.S. Patent Publication No. 2002/0011354 in the name of Barnett et al. (hereinafter "Barnett"). For the reasons set forth below, this rejection is respectfully traversed.

Barnett, as clearly shown in Figures 2 and 3 of Barnett, specifically discloses semiconductor chips **20** having active sides that face away from the substrate **14** (as evidenced by the use of wire bonds **22** for power distribution purposes). Thus, Barnett fails to disclose a semiconductor die having an active side that faces a substrate as required by amended independent claim 1 of the present application.

Accordingly, because (i) Barnett fails to disclose the limitations of amended independent claim 1 of the present application not disclosed or taught in Schaper, and (ii) Schaper is not combinable with Applicant's Admitted Prior Art Figure 1 as discussed above, amended independent claim 1 of the present application is patentable over Schaper, Applicant's Prior Art Figure 1, and Barnett. Dependent claim 4 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 6

Claim 6 of the present application was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of Applicant's Prior Art Figure 1 and U.S. Patent No.

6,215,171 issued to Pape et al. (hereinafter "Pape"). For the reasons set forth below, this rejection is respectfully traversed.

Pape, as clearly shown in Figure 1 of Pape, specifically discloses a semiconductor chip 2 having an active side that faces away from the substrate 1 (as evidenced by the use of wire bonds 42 for power distribution purposes). Thus, Pape fails to disclose a semiconductor die having an active side that faces a substrate as required by amended independent claim 1 of the present application.

Accordingly, because (i) Pape fails to disclose the limitations of amended independent claim 1 of the present application not disclosed or taught in Schaper, and (ii) Schaper is not combinable with Applicant's Prior Art Figure 1 as discussed above, amended independent claim 1 of the present application is patentable over Schaper, Applicant's Prior Art Figure 1, and Pape. Dependent claim 6 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 9 and 17

Claims 9 and 17 of the present application were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of U.S. Patent Publication No. 2002/0011662 in the name of Komiya et al. (hereinafter "Komiya"). For the reasons set forth below, this rejection is respectfully traversed.

Komiya, as shown in Figure 1 of Komiya, essentially discloses what is described as prior art in the present application (*see* Figure 1 of the present application). For reasons similar to that set forth above with respect to the treatment of claims 1-3 and 5 of the present application, Schaper fails to provide any motivation or suggestion to combine its

teachings with the teachings of Komiya to arrive at the limitations of amended independent claim 8 of the present application, which, in part, require that the semiconductor die have an active side that faces a top surface of the package substrate. In other words, Schaper fails to provide any motivation or suggestion to modify its teachings in view of Komiya (which is described as prior art in the present application) to include a semiconductor chip having an active side facing the substrate.

Further, Komiya is directed to an integrated circuit package that uses existing capacitance in an electronic part to reduce power supply impedance in a power supply system of the electronic part. *See* Komiya, paragraph [0006]. There is no suggestion or motivation in Komiya to modify its teachings to include a capacitor that is disposed around a semiconductor device of the integrated circuit package. Applicant notes that regardless of whether Schaper and Komiya can technically be combined, there must a suggestion within at least one of Schaper and Komiya expressing the desirability of combining the teachings of Schaper and Komiya. *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990).

Further, Komiya fails to disclose a semiconductor that has an active side arranged to face a substrate as required by amended independent claim 8 of the present application. Thus, Komiya fails to disclose those limitations of amended independent claim 8 of the present application not disclosed or taught in Schaper.

Accordingly, in view of the above, the combination of Schaper and Komiya is (i) improper and (ii) fails to render all the limitations of the claimed invention. Thus, amended independent claim 8 of the present application is patentable over Schaper and Komiya. Dependent claims 9 and 17 are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 10

Claim 10 of the present application was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of U.S. Patent No. 4,827,323 issued to Tigelaar et al. (hereinafter “Tigelaar”). For the reasons set forth below, this rejection is respectfully traversed.

Tigelaar, which is directed to a stacked capacitor (*see* Tigelaar, Abstract), is completely silent as to a semiconductor die having an active side that faces a substrate. Thus, Tigelaar fails to disclose the limitations of amended independent claim 8 of the present application not disclosed or taught in Schaper.

In view of the above, Schaper and Tigelaar, whether considered separately or in combination, fail to show or suggest the present invention as recited in amended independent claim 8 of the present application. Thus, amended independent claim 8 of the present application is patentable over Schaper and Tigelaar. Dependent claim 10 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 12-14

Claims 12-14 of the present application were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of U.S. Patent No. 4,839,712 issued to Mamodaly et al. (hereinafter “Mamodaly”). For the reasons set forth below, this rejection is respectfully traversed.

Mamodaly, which is directed to a combiner for semiconductor devices (*see*

Mamodaly, Abstract), is completely silent as to a semiconductor die having an active side that faces a substrate. Instead, as shown in Figures 3 and 6 of Mamodaly, energy is transferred to and from a top-facing active side (i.e., an active side facing away from substrate 11) of a semiconductor chip 1, 9 using a first choke 4 connected to a first capacitor 5 and a second choke 6 connected to a second capacitor 7. Thus, Mamodaly fails to disclose the limitations of amended independent claim 8 of the present application not disclosed or taught in Schaper.

In view of the above, Schaper and Mamodaly, whether considered separately or in any combination, fail to show or suggest the present invention as recited in amended independent claim 8 of the present application. Thus, amended independent claim 8 of the present application is patentable over Schaper and Mamodaly. Dependent claims 12-14 are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 15

Claim 15 of the present application was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of Mamodaly and Barnett. For the reasons set forth below, this rejection is respectfully traversed.

As discussed above, both Mamodaly and Barnett fail to disclose, or otherwise teach, a semiconductor die having an active side that faces the substrate. Thus, Mamodaly and Barnett fail to disclose the limitations of amended independent claim 8 of the present application not disclosed or taught in Schaper.

In view of the above, Schaper, Mamodaly, and Barnett, whether considered

separately or in any combination, fail to show or suggest the present invention as recited in amended independent claim 8 of the present application. Thus, amended independent claim 8 of the present application is patentable over Schaper, Mamodaly, and Barnett. Dependent claim 15 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 17

Claim 17 of the present application was rejected under 35 U.S.C. § 103(a) as being unpatentable over Schaper in view of Mamodaly and Pape. For the reasons set forth below, this rejection is respectfully traversed.

As discussed above, both Mamodaly and Pape fail to disclose, or otherwise teach, a semiconductor die having an active side that faces the substrate. Thus, Mamodaly and Pape fail to disclose the limitations of amended independent claim 8 of the present application not disclosed or taught in Schaper.

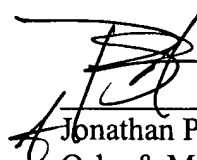
In view of the above, Schaper, Mamodaly, and Pape, whether considered separately or in any combination, fail to show or suggest the present invention as recited in amended independent claim 8 of the present application. Thus, amended independent claim 8 of the present application is patentable over Schaper, Mamodaly, and Pape. Dependent claim 17 is allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

V. Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 03226.092001; P5787).

Date: 6/3/04

Respectfully submitted,

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